



Grouting at the Idaho National Laboratory Tank Farm Facility

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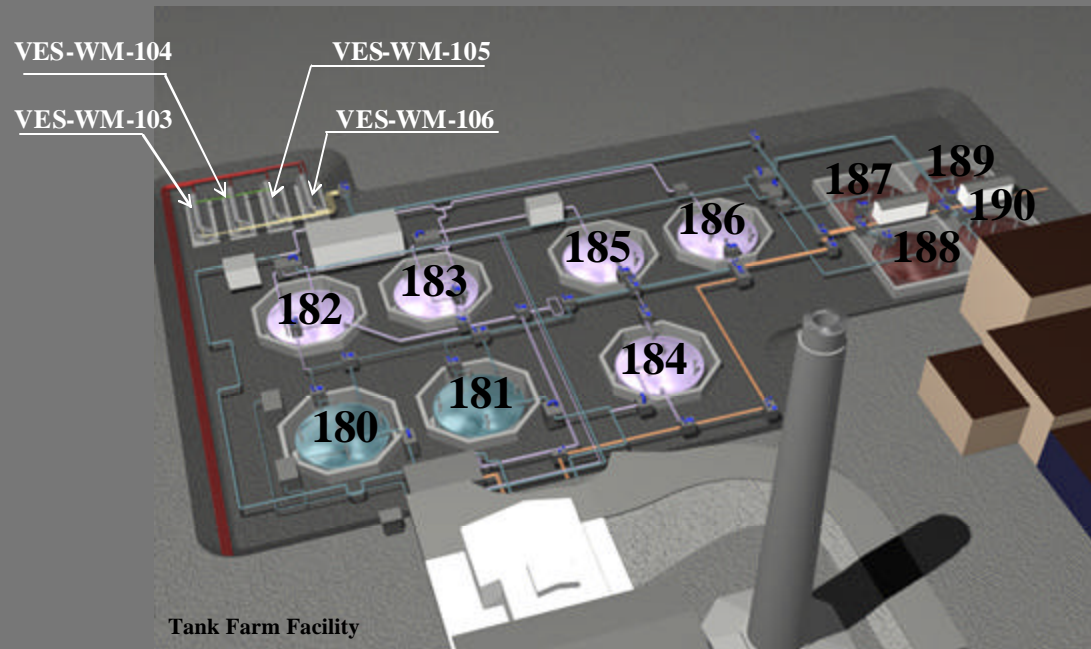
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Topics/Agenda

- Tank Farm Overview
- Tank and Vault Grouting
- Cooling Coil and Transfer Line Grouting



INTEC TANK FARM CLOSURE



- Octagon Vaults: WM-180, WM-181
- Pillar and Panel Vaults: WM-182, WM-183, WM-184, WM-185, WM-186
- Square Vaults: WM-187, WM-188, WM-189, WM-190

GV99 0008



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Relatively Small Tank Farm Facility

- A system of 11 underground, 300,000-gallon stainless steel tanks
 - Tanks are fifty feet in diameter and ~ twenty-five feet tall
 - Eight tanks have cooling coils for removing radioactive decay heat from highly radioactive wastes.
 - Each tank has ~ three 12 inch risers
- Each 300,000-gallon tank is in a concrete vault
- Four 30,000-gallon stainless steel tanks were also used for storage (taken out of service in the early 1980s)
- Four 300,000-gallon tanks currently in use—three are full and one is a spare.

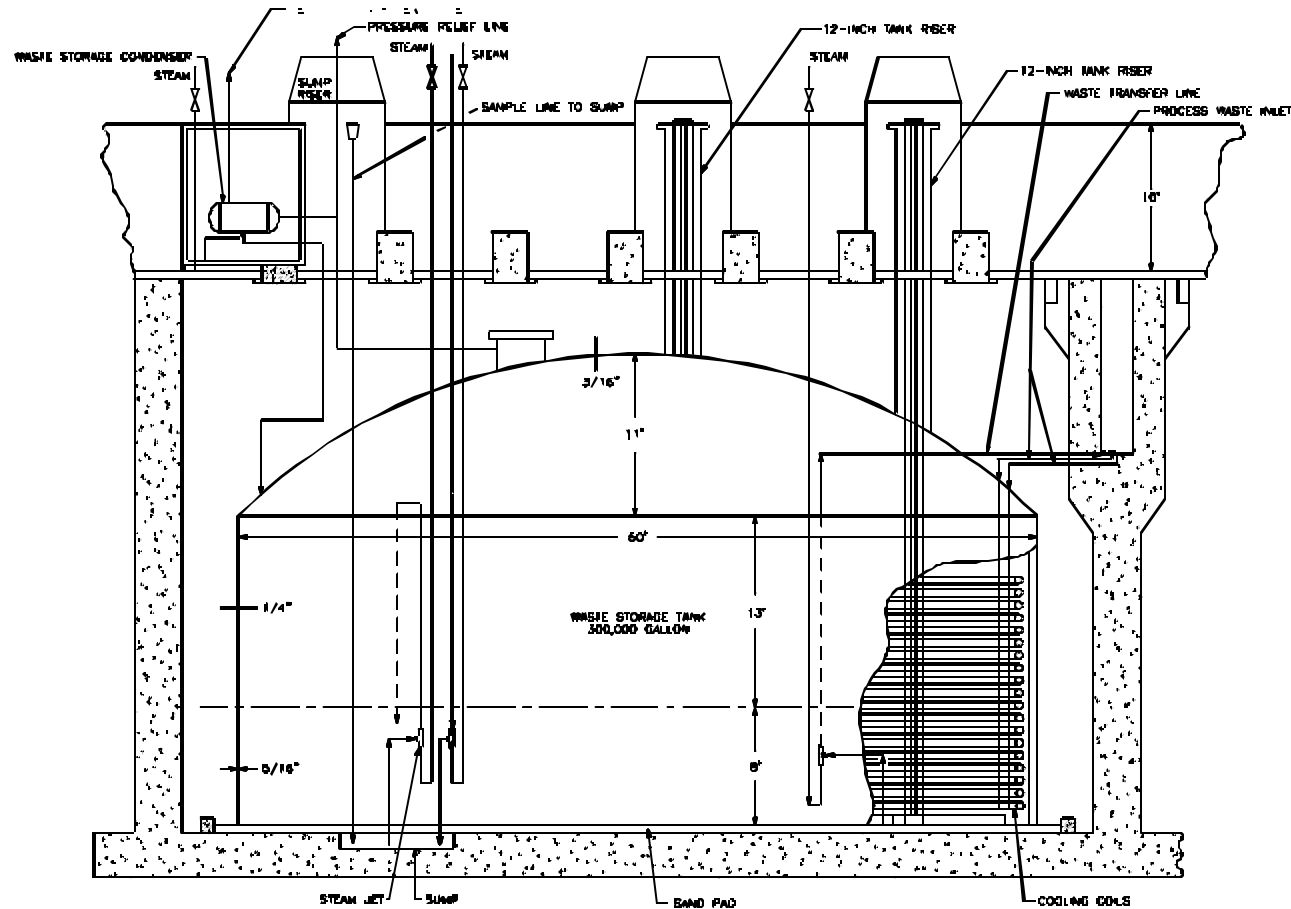


Idaho Tank Waste

- Several types of waste were stored in the tank farm:
 - Reprocessing wastes (1st, 2nd, 3rd cycle wastes)
 - Decontamination solutions
 - Laboratory wastes
 - Spent fuel basin water treatment discharges
 - Off-gas scrubber solutions
 - Sump water and condensate from tank farm transfer equipment
 - Other low activity miscellaneous plant wastes
- Tank wastes maintained as acidic solutions
- Evaporator systems used to minimize needed storage space
- ~9 million gallons of waste sent to tank farm
 - 900,000 gallons remain to be treated in IWTU

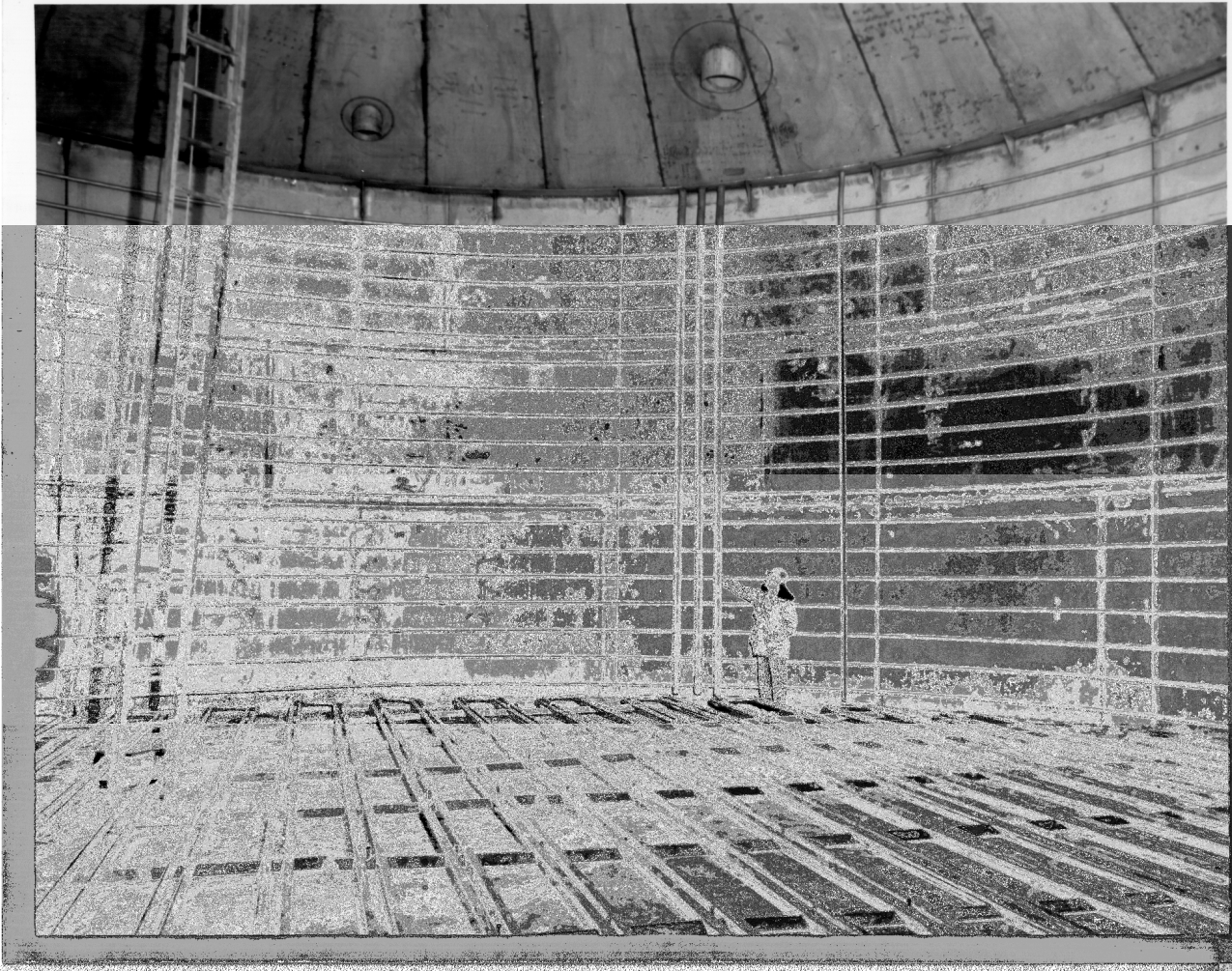


Cross-sectional view of a typical tank with cooling coils



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Construction Photo - Interior of Tank



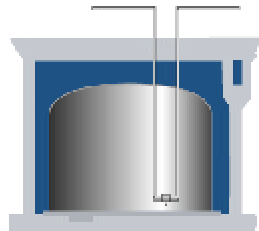
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Closure Progress - Summary

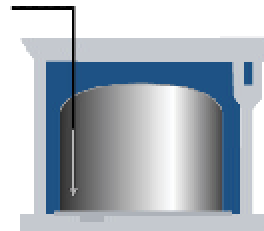
- Seven large (300,000-gal) tanks (and vaults) and four small (30,000-gal) tanks have been cleaned and grouted.
- Cooling coils have been grouted.
- Transfer line and tank riser grouting is underway.



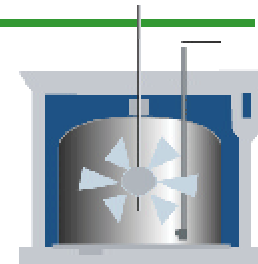
Tank Closure Sequence



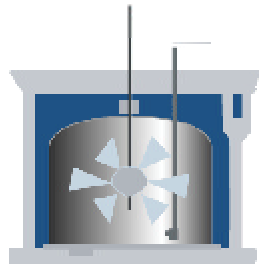
Empty to heel with existing jets



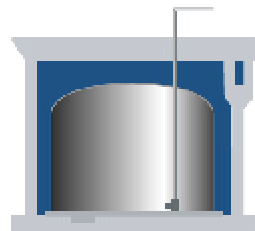
Flush piping into tanks



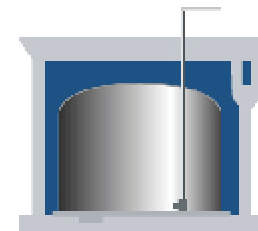
Install new steam jet and wash equipment



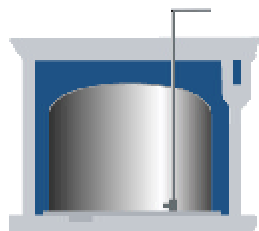
Wash tank and empty with new jet



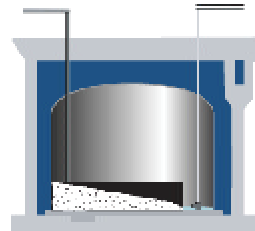
Video and sample tank residuals



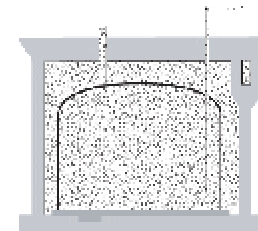
Tank evaluation



Obtain authorization to grout



Displace heel with grout



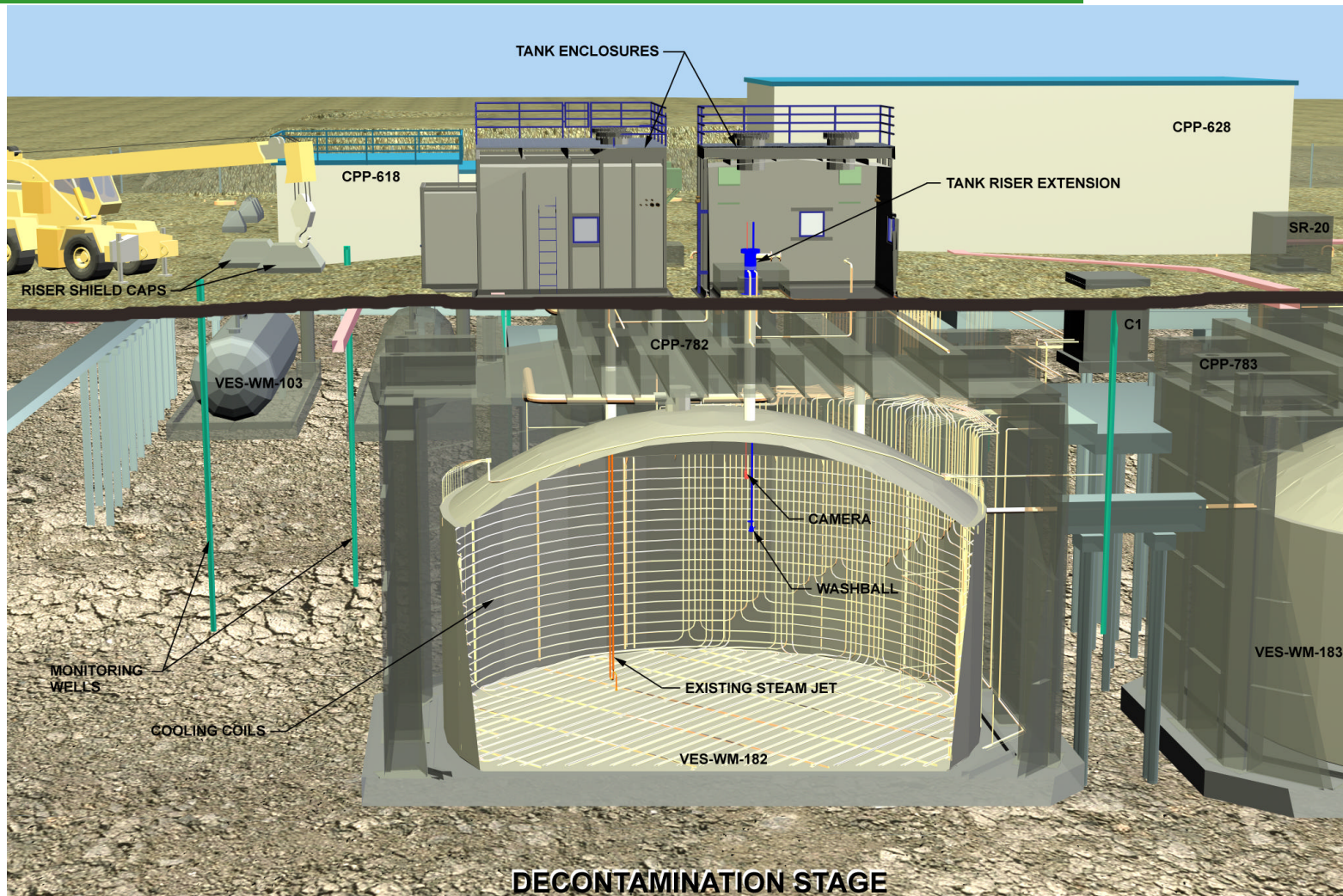
Fill tank, piping and vault with grout



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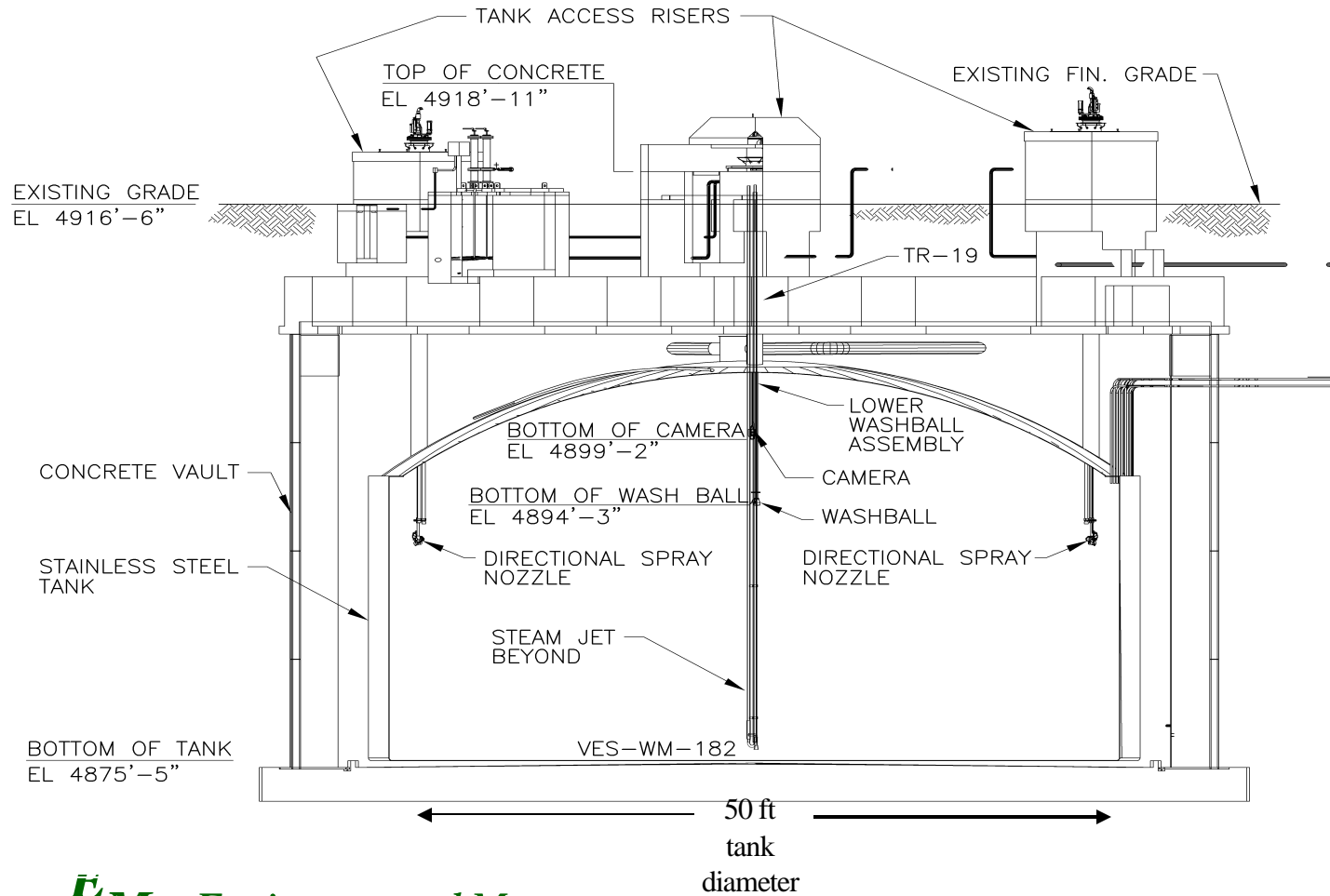
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Tank Washing Set-up



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Typical Tank Cleaning System

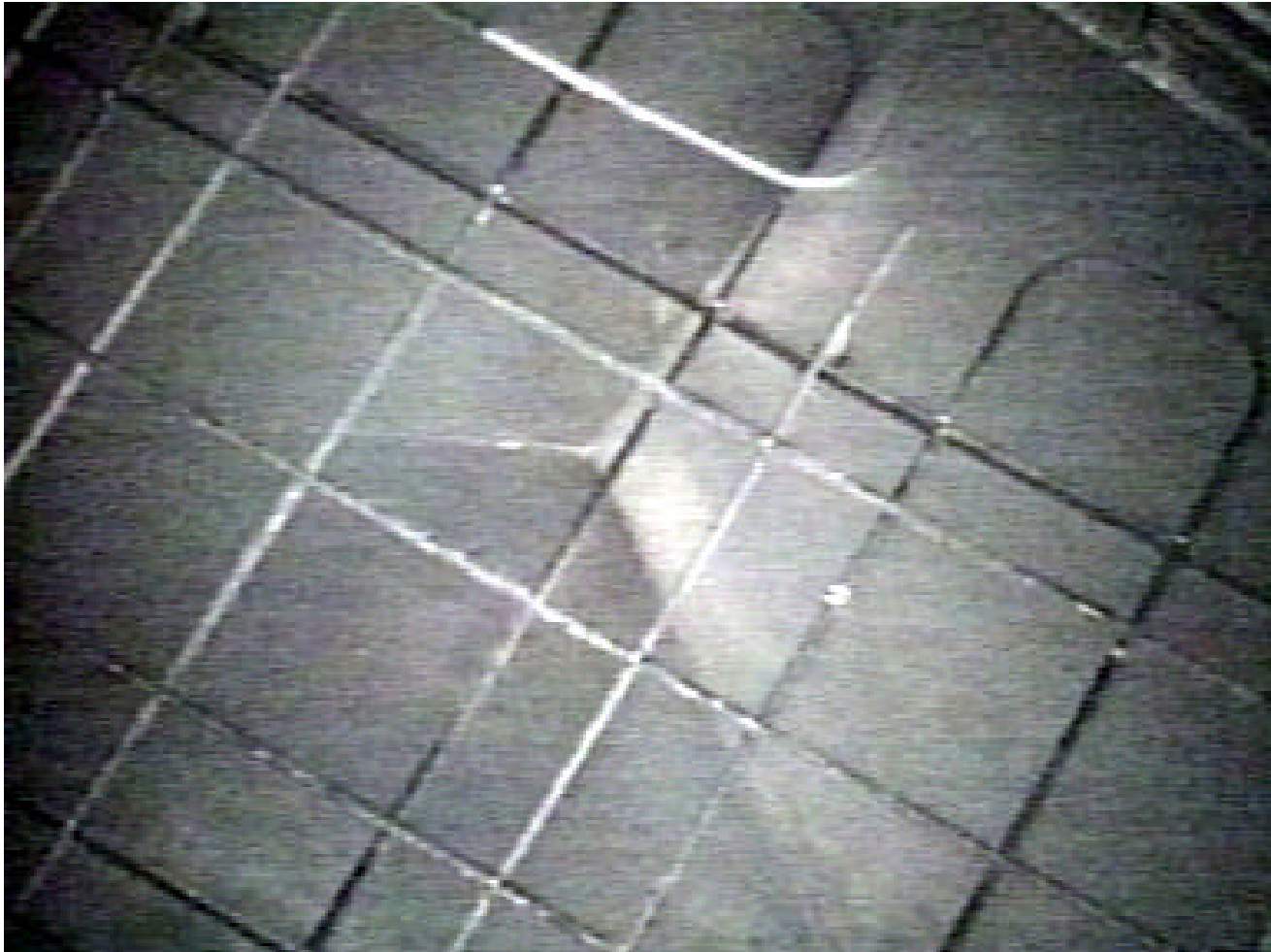


Spray Cleaning



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Tank WM-180 After Cleaning (Tank bottom)



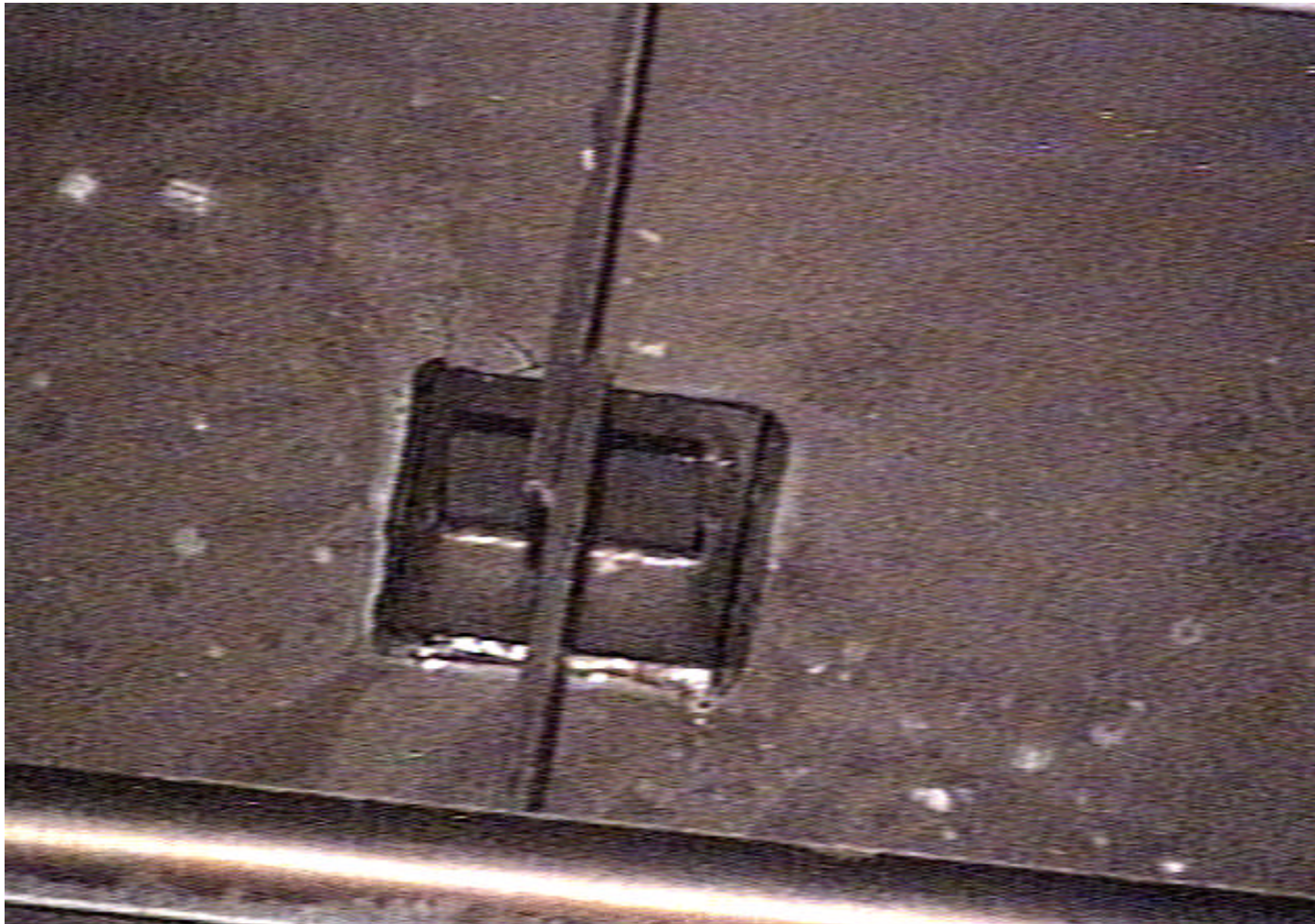
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Tank WM-182 After Tank Cleaning (Tank bottom)



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Tank WM-183 After Cleaning (Tank bottom base plate)



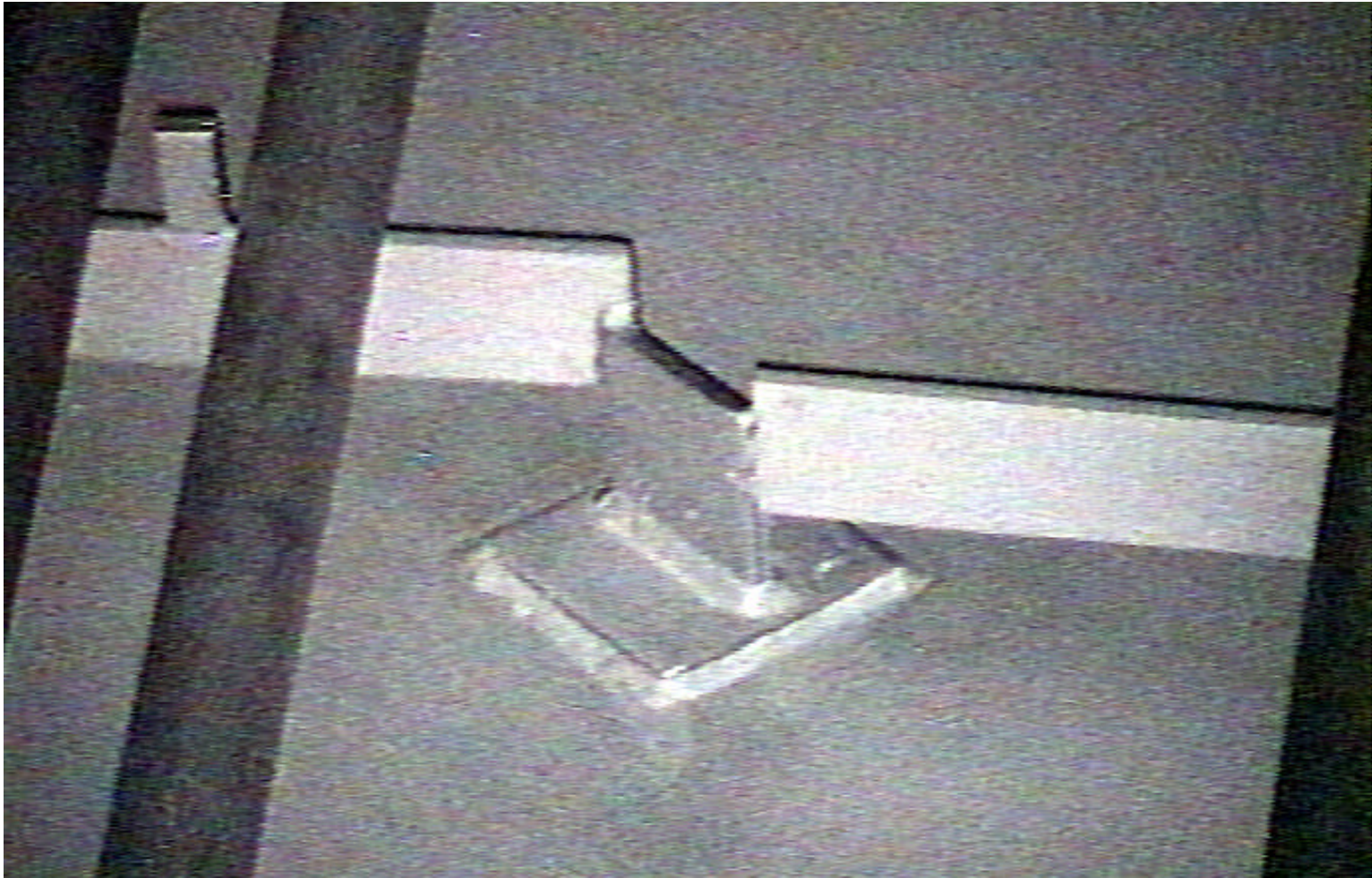
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Tank WM-185 After Cleaning (Tank bottom)



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Tank WM-185 After Cleaning (Tank bottom base plate)



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Tank WM-186 After Cleaning (Tank bottom)



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Grout Types

Three grout recipes were used...

- 1) Engineered Placement
- 2) Controlled Low Strength Material (CLSM)
- 3) Pipe Grout

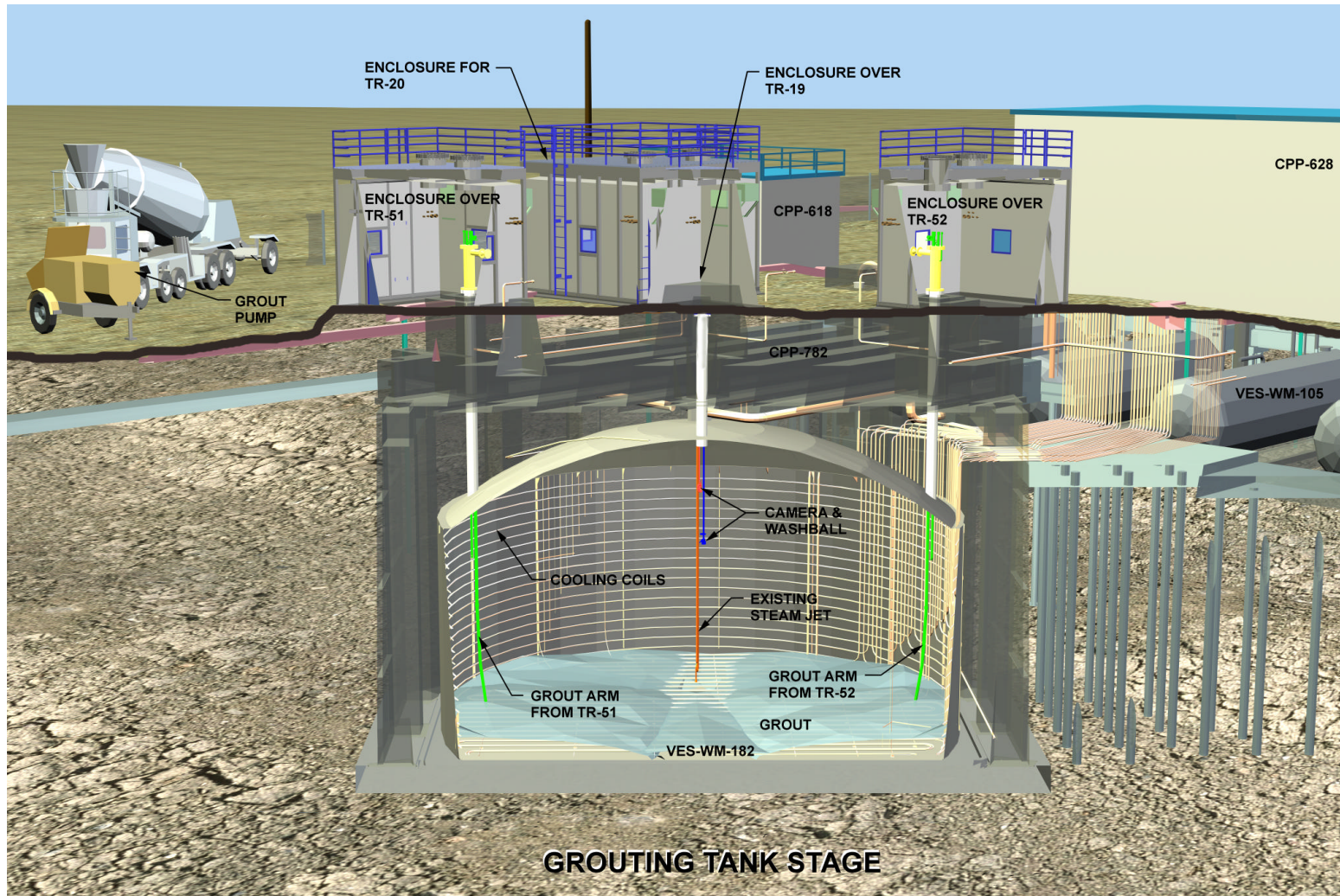


Engineered Placement Grout

- First 3-4 feet in bottom of tank, sequenced in six placements.
- Pushes residual solids toward steam jet, provides for some uplift and mixing, and encapsulates remaining residuals.
- Grout includes blast furnace slag to ensure reducing environment.
- Every truckload was tested.



Grout Addition

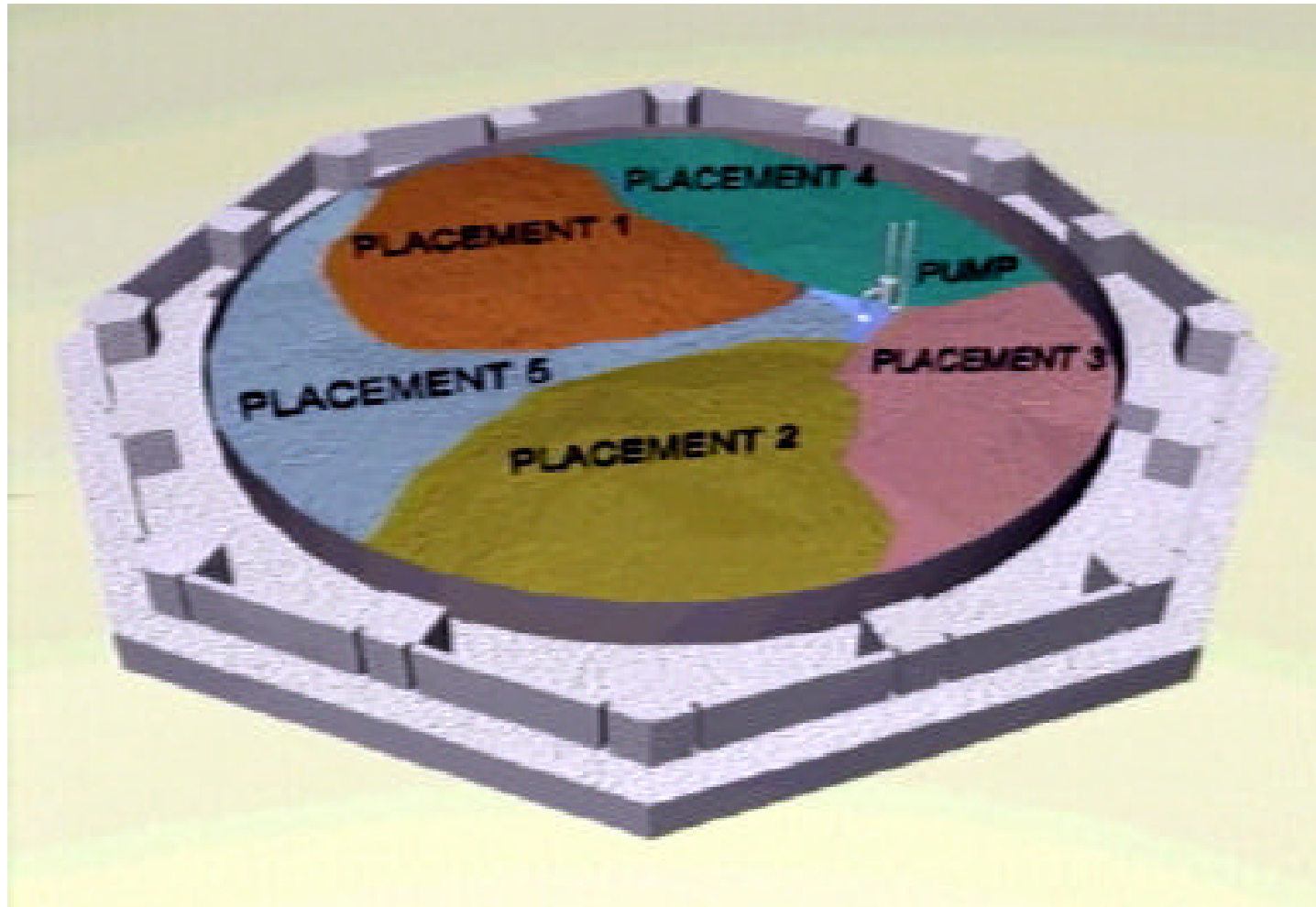


Grouting of WM-184 – August 2007



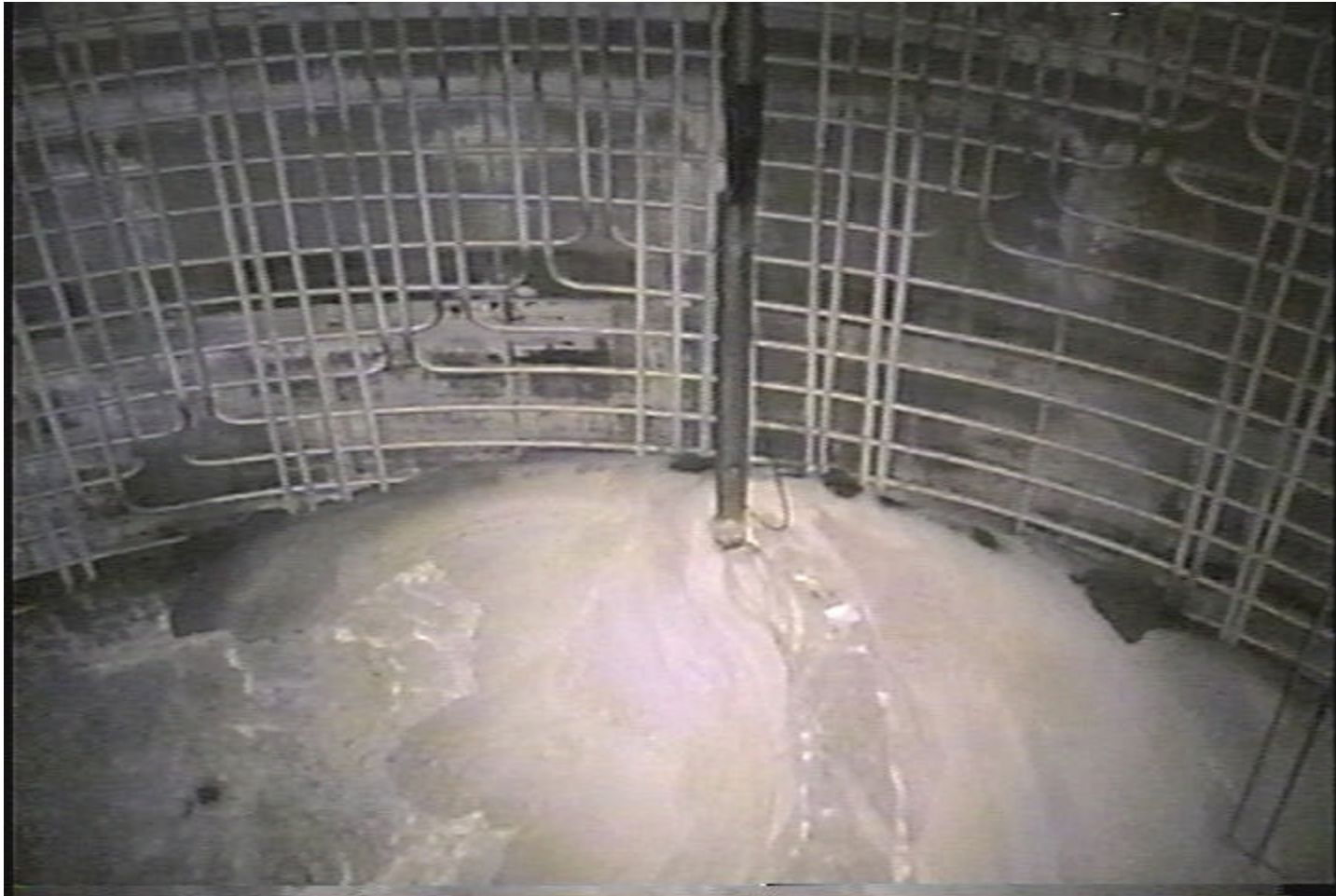
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Schematic of the engineered grout placement sequence



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Grout Mast from Riser TR-52



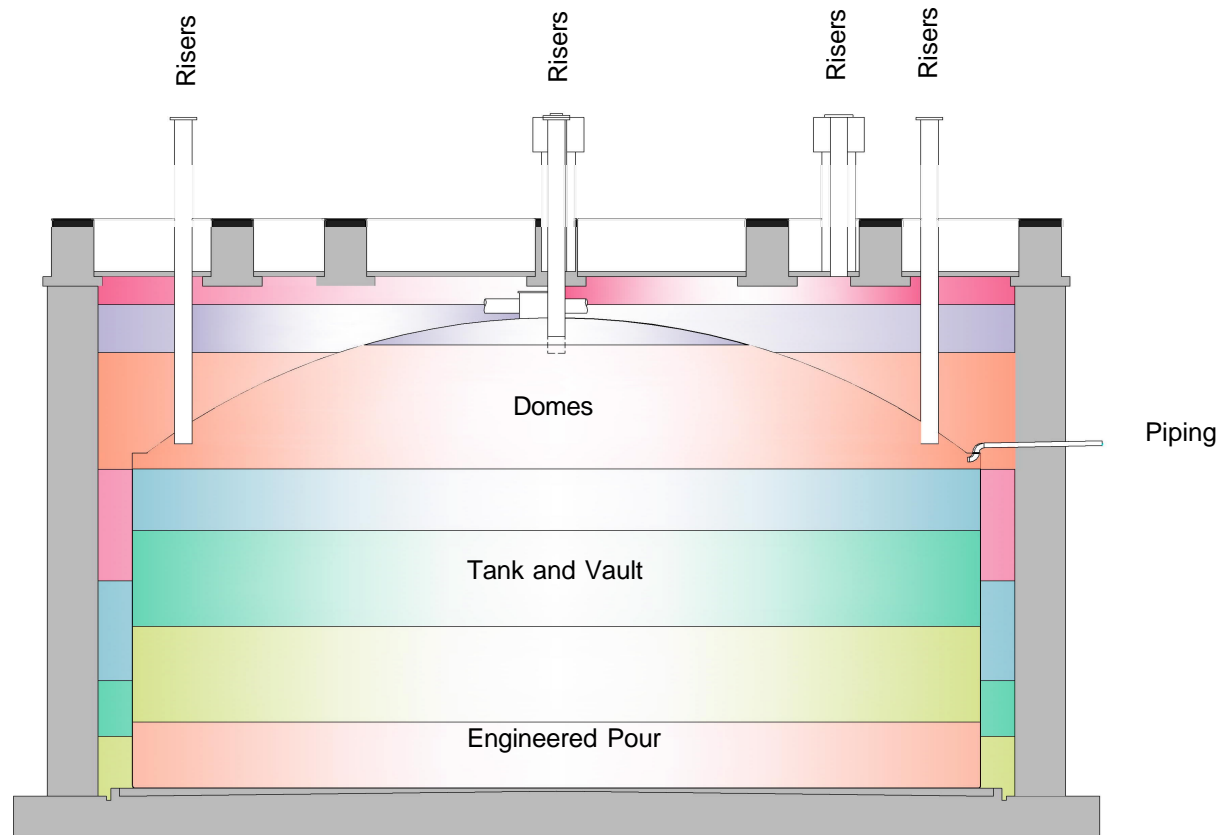
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- CLSM Pours

- Bulk fill from top of engineered placements to the dome level (riser access height), camera installed – placements in vault to match tank level
- Dome pours to fill most of dome section, fill location shifted to camera riser (no camera) - placements in vault to match tank level



Tank and Vault Layers



Pipe Grout

- Pipe Fill Grout Pours
 - Top of Dome Pours – requires modifications to off-gas piping to allow filling the very top of the domes, then completion of the top layer in the vault (over the tank domes)



Tank and Vault Grouting

- Started Tank Grouting in Nov 2006
- Finished in Feb 2008
- Used approximately 25,000 yd³ of Grout.



Grout Recipes

Engineered Placement Grout:

- Cement 230 lbs
- Blast Furnace Slag 351 lbs
- Pozzolan Class F 118 lbs
- Fine aggregate (sand) 2,491 lbs
- Water Up to 442 lbs (53 gal)
- High range water-reducer Up to 80 oz or as required to obtain slump and flow



Grout Recipes

Closure Controlled Low-Strength Material (CLSM)

- Cement 300 lbs
- Pozzolan Class C 200 lbs
- Fine aggregate (sand) 1890 lbs.
- Water 38 gal
- Rheocell 30 14.5 oz. per cubic yard
- Glenium 3030 18 oz/cwt. cementious material



Grout Recipes

Pipe Grout: (Hand Mix formula)

- Cement 94 lbs
- Pozzolan Class F 180 lbs
- Water 92 lbs (11 gallons)
- High range water-reducer 5 oz or as required to obtain flow

Pipe Grout: (Bulk from Batch Plant)

- Cement 750 lbs
- Pozzolan Class F 1831 lbs
- Water 700 lbs (84 gallons)
- High range water-reducer 5 oz per cwt cementitious material or as required to obtain flow



Cooling Coil Grouting

- Three of the 300k gallon and all four 30k gallon tanks had cooling coils.
- A total of 128 Cooling Coil lines
- 1 ½” diameter
- Each 300K gal tank had approx 9200’ of cooling coil



Cooling Coils



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Cooling Coils



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Cooling Coils



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Cooling Coils with Secondary Containment



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Cooling Coil Attachment Point



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Pipe Grout Mixer



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Cooling Coils Grouting

- Started April 28, 2008
- Finished May 13, 2008

- Used about 9 yd³ of Grout



Transfer Line Grouting

- Transfer lines have secondary containment
 - Both the primary line and the secondary containment are grouted
- Volume of grout needed to fill each line was calculated
- Material vented from line is managed as waste

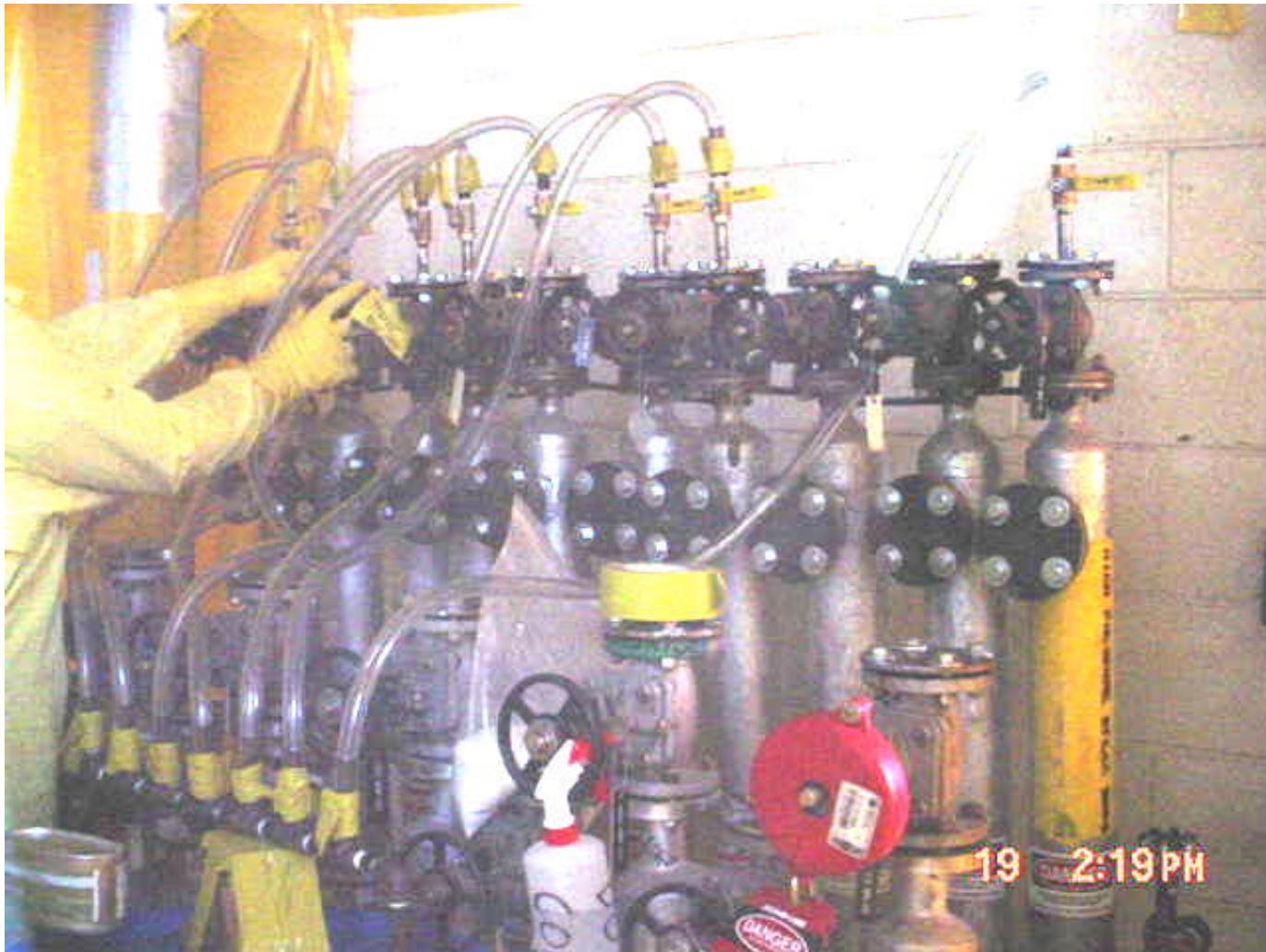


Transfer Line Grout Hookup



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Transfer Line Vent Points



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Transfer Line Vent Points



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Vent Points



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Transfer Line Grouting

- Transfer line grouting is underway
- About 300' of piping remains to be grouted
- To date, over 7 miles of piping has been grouted

